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Claims

1. A visual device for moving objects in an animation image, comprising:

means for capturing a frame image of said animation image;

means for memorizing said frame image as a digital image one by one;

means for generating a moving-object rough edge-information image from said digital image;

means for generating a moving-object formed edge-information image from said moving-object rough edge-information image by using said digital image;

means for detecting position and size of moving-object areas distinguished by said moving-object formed edge-information image;

means for counting a moving-object area number; and

means for keeping said moving-object area number.

2. A visual device for moving objects in an animation image, comprising:

means for capturing a frame image of said animation image;

means for memorizing said frame image as a digital image one by one;

means for generating a moving-object rough edge-information image from said digital image;

means for generating a moving-object formed edge-information image from said moving-object rough edge-information image by using said digital image;

means for segmenting moving-object areas from background by using said moving-object formed edge-information image;

means for detecting position and size of said moving-object areas;

means for counting a moving-object area number; and

means for keeping said moving-object area number.

3. A visual device according to claim 1 or claim 2, wherein an all-object area number is counted for all objects instead of said moving objects, by having means for vibrating said digital image.

4. A visual device for voluntary objects in an animation image taken by a moving camera, comprising:

means for capturing a frame image of said animation image;

means for memorizing said frame image as a digital image one by one;

means for generating a voluntary-object rough edge-information image from said digital image;

means for detecting position and size of voluntary-object areas distinguished by said voluntary-object rough edge-information image;

means for converting direction and magnification of said moving camera to position in environmental coordinate;

means for converting said position and said size of said voluntary-object areas to said position in said environmental coordinate;

means for selecting one of positions in said environmental coordinate for said voluntary-object areas;

means for inputing a control command from an external part;

means for generating a vibration command vibrating said moving camera;

means for controlling said position of said environmental coordinate where said moving camera must move; and

means for generating a camera command controlling said moving camera.

5. A visual device according to claim 4, comprising;

means for generating said voluntary-object formed edge-information image from said voluntary-object rough edge-information image by using said digital image;

means for segmenting said voluntary-object areas from background by using said voluntary-object formed edge-information image;

means for normalizing said voluntary-object areas;

means for keeping a voluntary-object normalized image;

means for recognizing said voluntary-object normalized image;

means for keeping a recognition result;

means for generating an environmental map represented by said environmental co-ordinate;

means for keeping said environmental map;

means for inferring said position of said voluntary objects in said environmental map;

means for counting a voluntary-object number;

means for keeping said voluntary-object number; and

means for carrying out geometrical analysis for said voluntary-object formed edge-information image.

6. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for vibrating a digital image, wherein each of said array operation units comprises:

means for initializing said array operation unit;

means for finishing processing if there is not said digital image to input any more;

means for inputing each of band-pixel values in said digital image;

means for vibrating each of said band-pixel values in said digital image virtically and horizontally; and

means for outputing each of band-pixel values of a vibrated image.

7. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for generating a rough edge-information image from a digital image, wherein each of said array operation units comprises:

means for initializing said array operation unit;

means for finishing processing if there is not said digital image to input any more;

means for inputing each of band-pixel values in said digital image;

means for generating each of band-pixel values in a smoothed image by smoothing each of said band-pixel values in said digital image;

means for generating each of band-pixel values in a logarithmic-conversion image by converting each of said band-pixel values in said smoothed image to its logarithm;

means for generating each of band-pixel values in an enhanced image by enhancing each of said band-pixel values in said logarithmic-conversion image;

means for generating each of band-pixel values in a time-differential image by subtracting each of band-pixel values in a previous enhanced image from each of said band-pixel values in said enhanced image, respectively;

means for superseding each of said band-pixel values in said previous enhanced image by each of said band-pixel values in said enhanced image, respectively;

means for generating each of band-pixel values in a time-differential Laplacian image by calcurating each of said band-pixel values in said time-differential image in terms of a Laplacian operator;

means for generating each of band-pixel values in a time-differential zero-point image by extracting a zero-point for each of said band-pixel values in said time-differential Laplacian image;

means for generating a band-pixel value in a maximum-value time-differential zero-point image by detecting a maximum value among all of said band-pixel values in said

time-differential zero-point image;

means for generating each of band-pixel values in a Laplacian image by calcurating each of said band-pixel values in said enhanced image in terms of said Laplacian operator;

means for generating each of band-pixel values in a zero-point image by extracting a zero-point for each of said band-pixel values in said Laplacian image;

means for generating a band-pixel value in a maximum-value zero-point image by detecting a maximum value among all of said band-pixel values in said zero-point image;

means for generating a band-pixel value in a mixed zero-point image by detecting a maximum value between said band-pixel value in said maximum-value zero-point image and said band-pixel value in said maximum-value time-differential zero-point image;

means for generating a band-pixel value in a hole-deleted mixed zero-point image by deleting a hole of said mixed zero-point image;

means for generating a band-pixel value in a noise-canceled mixed zero-point image by deleting an alone point and an alone hole of said hole-deleted mixed zero-point image;

means for generating a band-pixel value in said rough edge-information image by inverting each of said band-pixel values in said noise-canceled mixed zero-point image; and

means for outputing said band-pixel value in said rough edge-information image.

8. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for generating a formed edge-information image from a rough edge-information image, wherein each of said array operation units comprises:

means for initializing said array operation unit;

means for finishing processing if there is not a digital image or said rough edge-information image to input any more;

means for inputing each of band-pixel values in said digital image and a band-pixel value in said rough edge-information image;

means for separating each of said band-pixel values in said digital image and said band-pixel value in said rough edge-information image;

means for generating each of band-pixel values in a smoothed image by smoothing each of said band-pixel values in said digital image;

means for generating each of band-pixel values in a logarithmic-conversion image by converting each of said band-pixel values in said smoothed image to its logarithm;

means for generating each of band-pixel values in an enhanced image by enhancing each of said band-pixel values in said logarithmic-conversion image;

means for generating each of band-pixel values in a Laplacian image by calcurating each of said band-pixel values in said enhanced image in terms of a Laplacian operator;

means for generating each of band-pixel values in a zero-point image by extracting a zero-point for each of said band-pixel values in said Laplacian image;

means for generating a band-pixel value in a maximum-value zero-point image by detecting a maximum value among all of said band-pixel values in said zero-point image;

means for generating a band-pixel value in a based edge-information image by inverting said band-pixel value in said maximum-value zero-point image;

means for operating orthopedically a band-pixel value in said rough edge-information image as approaching it to said band-pixel value in said based edge-information image;

means for generating a band-pixel value in a formed edge-information image by complementing line width of said band-pixel value in said rough edge-information image; and

means for outputing said band-pixel value in said formed edge-information image.

9. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for detecting position and size of object areas,

wherein each of said array operation units comprises:

means for initializing said array operation unit;

means for finishing processing if there is not a rough edge-information image to input any more;

means for inputing a band-pixel value in said rough edge-information image;

means for converting said band-pixel value in said rough edge-information image to a band-pixel value in a redundant-information image;

means for converting a transfer value derived from said redundant-information image to a band-pixel value in a transfer-value image by operating imagery of position;

means for transfering said band-pixel value in said redundant-information image to a transfer position directed by said band-pixel value in said transfer-value image;

means for updating said band-pixel value in said redundant-information image by summation of said band-pixel values transfered from their original positions in said redundant-information image; and

means for outputing said band-pixel value in said redundant-information image.

10. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for normalizing object areas, wherein each of said array operation units comprises:

means for initializing said array operation unit;

means for finishing processing if there is not an object-area image or a digital image to input any more;

means for inputing a band-pixel value in said object-area image and each of band-pixel values in said digital image;

means for generating a band-pixel value in an updated object-area image and each of band-pixel values in an updated image by separating said band-pixel values in said

object-area image and each of said band-pixel value in said digital image;

means for converting a transfer value derived from said updated object-area image to a band-pixel value in a transfer-value image by operating imagery of position;

means for generating a band-pixel value in a transferable image according to a redundant number at a transfer position directed by said pixel-band value in said transfer-value image;

means for transfering said band-pixel value in said updated object-area image to a transfer position according to judgement in said transferable image;

means for transfering said band-pixel value in said updated image as said band-pixel value in said updated object-area image was transfered;

means for complementing said band-pixel value in said updated object-area image not included in said object areas with the average of neighbor band-pixel values within said object areas;

means for complementing each of said band-pixel values in said updated image as said band-pixel value in said updated object-area image was complemented; and

means for outputing each of band-pixel values in a normalized image generated after complementing said updated image.

11. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes pattern matching in means for recognizing a normalized image, wherein each of said array operation units comprises:

means for arranging said array operation units in the shape of a lattice;

means for initializing said array operation unit;

means for inputing a band-pixel value in a template image until said template image to input does not exist any more;

means for finishing processing if there is not said normalized image to input any

more;

means for inputing band-pixel values in said normalized image;

means for computing a matching result;

means for updating a matching-result image; and

means for outputing a band-pixel value in said matching-result image.

12. A visual device comprising array operation units arranged in the shape of a lattice in a data processing device that realizes means for separating object areas by using a formed edge-information image, wherein each of said array operation units comprises:

means for arranging said array operation units in the shape of a lattice;

means for connecting a nonlinear oscillator in said array operation unit with nonlinear oscillators in its neighbors in terms of link values;

means for initializing said array operation unit;

means for finishing processing if there is not said formed edge-information image to input any more;

means for inputing a band-pixel value in said formed edge-information image;

means for computing an external noise;

means for computing a neighbor input summation of said nonlinear oscillator;

means for computing parameters in said nonlinear oscillator;

means for computing an output of said nonlinear oscillator;

means for computing a contour parameter;

means for computing a border parameter; and

means for outputing a band-pixel value in an object-area image including said object areas separated by said nonlinear oscillator.

13. A visual device including a plurality of array operation units, comprising:

means for arranging said array operation units in the shape of a lattice;

means for connecting said array operation unit with neighbor array operation units each to each, according to each position of said array operation units;

means for communicating said data to said adjoining array operation units; and

means for operating each of said array operation units independently;

wherein each of said array operation units includes:

means for inputing data;

means for memorizing said data one by one;

means for transmitting said data with other array operation units;

means for computing by using said data; and

means for outputing said data.

14. A visual device including a plurality of array operation units, comprising:

a processor having means for operating input data;

a memory for memorizing a program and variables operating said data; and

a controler for communicating with said adjoining array operation units;

wherein said controler comprises:

means for memorizing said input data in said memory;

means for sending said variables in said memory to said adjoining array operation units; and

means for memorizing said variables sent from said adjoining array operation units in said memory.